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Authors' Response to: Commentary by Ian Phillips,

Making sense of blindsense

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Abstract

We recently published the results of a study on the occurrence of blindsight among eight, post-stroke homonymous hemianopic (HH) patients (Garric et al., 2019), in whom we measured blindsight through forced-choice tasks and assessed perceptual experiences by a new awareness scale, the *Sensation Awareness Scale (SAS)*. Within the cohort, we found different profiles of dissociation between objective and subjective performance. Importantly, we were able to describe several cases of a dissociation phenomenon that we named *blindsense*, whereby patients exhibited marked subjective sensitivity in their blind hemifield despite being unable to discriminate the different stimuli. Following publication of our article (Garric et al., 2019), Prof. Ian Phillips (Phillips, 2019) wrote a Commentary in which he questioned the methodology we used to measure and analyze objective and subjective perception in our HH patients. As opposed to our original interpretation of our results to describe the new profile of blindsense, based on a non-visual experience hypothesis (Kentridge, 2015), Prof. Phillips re-evaluated the different blindsight profiles that we identified in our study through the lens of a degraded conscious vision hypothesis (Overgaard, FehI, Mouridsen, Bergholt, & Cleeremans, 2008). In

the present response, we explain that, although we agree that dichotomous visual scales lead to highly conservative responses and mask conscious perceptual experience of patients, we still support the notion that nuanced report protocols can enable more-sensitive measurements of perceptual experiences in the hemianopic, so-called *blind* visual field. Furthermore, we affirm that the additional awareness-scale phenomenal levels that such protocols enable are more consistent with patients' experiences and lead patients to provide more liberal responses when describing their subjective perceptions.

Measuring subjective experiences in the contralesional hemianopic visual field

Subjective reports are ambiguous because they depend on a series of elements: *firstly, the actual perceptual experiences of patients; secondly, patients' interpretation of these experiences; and finally, patients' verbal reports of the interpretations.* Moreover, the elements become more complex in the case of asking homonymous hemianopic (HH) patients to describe what is happening in their (clinically diagnosed) blind hemifield. In these cases, patients may respond with varying levels of confidence, doubt, and conservative or liberal responses. Therefore, investigating whether HH patients have any perceptual experience in their blind hemifield, and understanding whether their perceptions correspond to residual vision or to a more phenomenal or abstract experience, are critical and challenging issues in the blindsight literature. Unfortunately, such assessments have rarely been performed in groups of hemianopic patients. In order to address this gap, we recently proposed a five-level awareness scale, the SAS. Importantly this scale was not copied from those used in healthy participants, but based on spontaneous self-reporting by HH patients: (1) I did not see anything; (2) I don't think that I saw nothing, but I'm not sure; (3) I felt something; (4) I saw something; and (5) I clearly saw something and can identify it. The distinction between (3) and (4) in particular was directly inspired from patients spontaneous reports, as it would not occur to subjects with normal vision that such distinction could exist.

In his Commentary, Phillips (2020) argues that the SAS cannot be considered to be a scale because of the lack of continuity between the different levels—notably, as a consequence of level 3. In particular, Phillips claims that “someone could *feel something* [level 3] but *see nothing* [level 1]”. However, our aim was precisely to disentangle the feeling that ‘something was there’ from the visual, perceptual, experience in the blind visual field. Indeed, our aim in designing and using the SAS was to ascertain any possible distinction between a visual perception of a stimulus in the blind visual field and a subjective experience of the presence of that stimulus. Accordingly, our data indicated that a patient could acknowledge having had a subjective experience in their blind external visual field without having had perceived (*per se*) that stimulus. Moreover, although Phillips’ claim of a lack of continuity in the SAS could be defended from a strictly psychophysical point of view, it still seems reasonable to call “scale” a collection of categories with some form of ordering between them. Actually we have no guarantee of a strict continuity between the levels of the most commonly used awareness scale, the Perceptual Awareness Scale. During our subjective awareness task, we taught our patients to use a graduated scale and to respond with a number from 1 to 5. We clearly explained the labels of each level to the patients at the beginning of the experiment and displayed the levels on the screen to the patients each time that an SAS response was required. The graduated character of this scale is particularly reflected in the use of progressive degree of certainty (*e.g.* level 2: “*I don’t think that I saw anything, but I’m not sure*” and level 5: *I clearly saw something and can identify it*). We have considered the possibility that a *feeling* could correlate with the first level of awareness; however, and as we mention in the original paper, we designed the SAS based on spontaneous-HH patients’ reports, who seem to employ phenomenal vocabulary principally when they perceive that something happens during stimulation. Finally, beyond the question of whether this specific level of our scale is at the right position relative to the others, the real question is whether this category is meaningful for describing the patients’ perception or not. If it is, our scale should capture nuances that cannot be captured by other measures. And this is exactly what we observe.

In line with his claim about a purported lack of continuity in the SAS, Phillips suggests that the SAS cannot be statistically analyzed as a scale. He also suggests that the assessment of subjective sensitivity might be more accurate by “*focusing on whether sensitivity in the two objective tasks corresponds to reported awareness* “. He argues that in our paper, we wrongly classified patient P2 as having type I blindsight (the only case without any awareness of the stimuli), and he asserts that “If P2 has blindsight, it would seem to be type II.” Contrariwise, we believe that computing ROC curves and comparing the area under these curves (AUC) in target trials and catch trials (*i.e.* measuring whether the distribution of responses on the SAS were significantly different between the presence or absence of a stimulus on the screen), provides an accurate measure of subjective sensitivity, independent of response bias, as dictated by signal detection theory. In patient P2, although response distributions on the scale show slight differences for target and catch trials (see Garric *et al.*, Fig. 5), our analysis confirms that they are not statistically different. In other words, this patient is not sensitive to the presence of the stimulus when using the subjective scale.

Blindsight, blindsense or residual vision?

By employing visual detection tasks, visual discrimination tasks, binary responses (*stimulus is present or absent*; and *stimulus is X or O*) and the SAS in our study on eight HH patients, we had expected to observe distinct patterns of dissociation between objective and subjective perception in the blind visual field. Gathering results from previous studies on blindsight and new predictions, we expected four profiles:

Absence of blindsight: objective performance and subjective performance both at chance level;

Type I blindsight: objective performance above chance level, without any statistically significant subjective sensitivity;

Type II blindsight: objective performance and subjective performance both above chance level, without any conscious detection in the blind visual field;

Blindsense: objective performance at chance level combined with a statistically significant subjective performance

In our study, we identified blindsight profiles (types) according to *literature definitions*, and then quantified these profiles in our cohort. Nonetheless, one could argue that the definitions that we employed, originally proposed by distinct authors based on different case studies and methodologies, are less than optimal for classifying patient performance. On the one hand, classifying the performance of patients based on previous studies can generate confusion, as exemplified in what Phillips refers to as the “*unremarked puzzle*” of patients P6 and P7 in our study. These patients represented the two most striking blindsense profiles: *they were at chance level for the two binary tasks (detection and discrimination) yet demonstrated significant subjective sensitivity on the SAS*. We agree with Phillips that interpreting the chance-level performance on the detection binary task as an “*absence of sensitivity*” is confusing, as we argued that these patients had been able to feel ‘something’. However, this situation highlights the case of literature based on binary (*conscious/unconscious*) responses. Thus, the solution to this “*puzzle*” is what we had already provided as the main conclusion in our paper: “*assessment of detection performance through a binary choice in patients strongly depends on the patients’ decision criteria*”. Indeed, challenging the blind visual field of HH patients can provoke them to provide highly conservative responses. Ultimately, the debate hinges on the mechanism that underpins each patient’s blindsight behavior (*e.g.* unconscious/conscious or visual/non-visual), which shape the definition—and consequently, researchers’ understanding—of blindsight. On the other hand, using the pre-existing definitions, as we had, enabled us to identify a new dissociation that is not revealed by the classical literature descriptions: that of *blindsense*, whereby patients exhibit significant subjective reporting yet do not exhibit any residual visual discrimination. Phillips strongly disagreed, affirming that “*blindsense is neither novel nor surprising*” and drawing a parallel to the situation of healthy subjects being tasked with discriminating between metameric colors. But what we observe in our patients showing blindsense is actually opposite to the example of metameric colors: while human can never be sensitive to two distinct metameric colors, whatever the scale you use, our blindsense

patients could very well distinguish the presence or absence of a stimulus using the SAS scale while failing to do so using a forced choice (present or absent). Finally we believe that comparing blindsense to any type of perception in healthy control subjects remains, at this stage, both difficult and premature. In fact, to the best of our knowledge, in our article (Garric et al., 2019), we provided the first literature report of a dissociation between subjective perception of the presence of a stimulus in the absence of significant objective detection (or discrimination). Based on the number of patients exhibiting this pattern in our study (Garric et al., 2019), one could reasonably consider that in the greater HH population, the occurrence of this perceptual pattern would be higher than that of classical blindsight.

In conclusion, although we agree with the idea that conscious perception in the blind hemifield is masked by binary tasks in blindsight paradigms, our aims with this response are to counter Phillip's arguments and illustrate that they are not sufficient to corroborate his hypothesis that the phenomena that we had observed in our original study on HH patients simply correspond to residual vision. Indeed, the commentary (Phillips, 2019) brings into question the very definition of blindsight and its underlying mechanisms. According to Phillips, the phenomenon that we denoted as *blindsense*—reflected in HH patients reporting of 'feeling that something was there' in the absence of objective visual detection or discrimination—could simply be read as a demonstration of residual conscious vision in HH patients during a blindsight task. In fact, patients' ability to report doubts about the presence of a stimulus ('there may have been something on the screen but I did not visually perceive it') without any objective or subjective visual perception of it points to *non-visual perception*, just as we had defined blindsense, rather than to a *degraded form of visual perception*. However, what Phillips refers to as 'degraded vision' could simply refer to what we refer to as *blindsense*— a new form of non-visual perception described as a patient's *subjective knowledge that a stimulus has been presented in the absence of objective visual detection or discrimination*.

This response letter is also an opportunity for us to highlight another issue that could emerge with the measurements discussed in this debate. Beyond conservative responses that could be observed with blindsight patients, *metacognition assessment* could provide more-accurate measurements of patients' insight into their perceptual experiences in their blind visual field. To date, several indices for measuring metacognitive capacities have been proposed, among which the meta- d' (Maniscalco & Lau, 2012) appears to be the gold standard. For our group to assess metacognition, and to successfully disentangle sensation from metacognition, we would have to combine our SAS scale with another scale. We hypothesize that the ratio of d' to meta d' ($d'/\text{meta } d'$) in HH patients would be lower than in controls, due to dissociations among perception, sensation and awareness.

Finally, we thank Dr. Phillips for his clear and complete feedback on our original study and hope that this debate will inspire further commentary and new lines of study.

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